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(54) Dual voltage module interconnect

(57) A component card interconnect apparatus for coupling a component card to a computer system. A component card includes a first group of in-line pins with first power pins for conveying a first voltage and a second group of in-line pins with second power pins for conveying a second voltage. The second voltage is lower than the first voltage. Either the first or the second voltage is conveyed at one time.

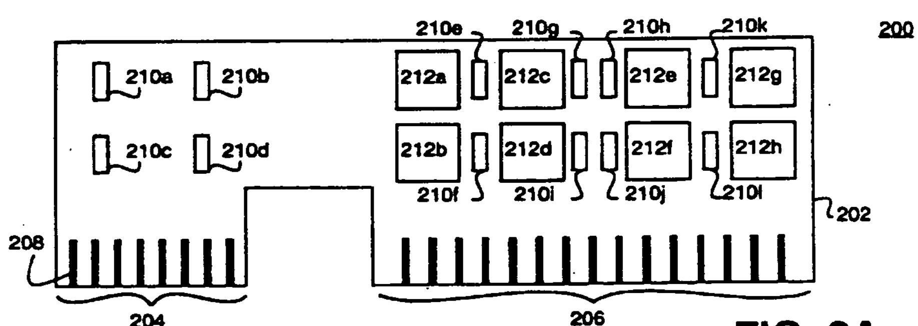

FIG. 2A

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Descripti n

FIELD OF THE INVENTION

The present invention relates to the field of computer systems. More particularly, the present invention relates to the field of component cards inserted into buses of computer systems.

BACKGROUND OF THE INVENTION

Computer systems and computer components are being developed to operate using lower and lower voltages. It is currently typical for older systems to operate with 5 volts and for newer systems to operate with 3.3 volts. As systems are developed to operate with lower voltages, problems of compatibility between systems and add-on components can occur. For example, a purchaser of a new system using a lower voltage than the old one may wish to continue using add-on memory modules from the old system because buying new memory modules would be expensive. Even though 3.3 volt systems are able to supply both 3.3 and 5 volts to components, current 3.3 volt systems incur difficulties when using previous, 5 volt components. For example, it may be necessary to provide special component sockets and cards for each voltage to prevent a component card from inadvertently being inserted in a socket with an improper voltage, causing it to be damaged. Supplying extra sockets on a system printed circuit board, however, uses up board space, which should be avoided.

Problems can also occur with the use of a 3.3 volt peripheral card in 5 volt signaling environment. The concern described above regarding accidental damage to components due to their receiving an improper voltage exists.

What is needed is an interconnect which allows interchangeable component cards to operate satisfactorily over different voltages without the addition of extra sockets.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the invention to provide a component interconnect for components using either of two, different voltages.

As will be seen, the present invention provides a novel computer module interconnect which allows a system operating predominantly with a newer, lower voltage to use newer, lower voltage components or older, higher voltage components. The present invention provides this functionality with only one type of card and socket, while alleviating prior signal corruption problems.

A component card interconnect apparatus for coupling a component card to a computer system is described. The interconnect apparatus comprises a component card, including a first group of in-line pins with first power pins for conveying a first voltage and a second group of in-line pins with second power pins for conveying a second voltage. The second voltage is lower than the first voltage. Either the first or the second voltage is conveyed at one time.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of a portion of a computer system of the present invention;
FIG. 2A is a simplified illustration of an embodiment of the dual voltage component card of the present invention;
FIG. 2B is an end view of the embodiment illustrated in FIG. 2A; and
FIG. 2C is a simplified illustration of an embodiment of the dual voltage socket of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention as described below operates in a computer system supplying both a higher voltage and a lower voltage to system components, for example 5 volts and 3.3 volts. The component card of the present invention can include 5 volt integrated circuits (ICs) or 3.3 volt ICs. When 5 volt ICs are used, however, other components of the system receiving signals from the component card should be 5 volt input/output (I/O) tolerant to avoid damage to the other components. For example, in an embodiment in which the component card is a 5 volt memory module, a 3.3 volt memory controller communicating with the component card should be capable of receiving signals at a higher voltage than 3.3 volts without damage.

FIG. 1 is a block diagram of a portion 100 of a computer system of the present invention. Portion 100 includes memory bus 102. Processor 104 and main memory 108 are coupled to memory bus 102. Processor 104 accesses data from main memory 104 through memory bus 102. Main memory 108 includes random access memory (RAM). For this embodiment, RAM is in the form of component cards or modules which contain IC RAMs and attach to memory bus 108 at interconnect 120. Component cards and interconnects will be described more fully below. In other embodiments, additional components could be coupled to memory bus 102.

Bus adapter 106 coupled to memory bus 102 and I/O bus 110 performs functions that allow the transfer of data between the two buses. For example, bus adapter 106 controls "traffic" between the buses to prevent data collisions. I/O bus 110 transfers data entering or exiting portion 100 from and to network bus 118. Network bus 118 connects to different processors in the computer system. I/O controllers 112 and 116 are examples of types of I/O controllers attachable to I/O bus 110 for facilitating specific types of communication between

portion 100 and devices exterior to portion 100. For example, I/O controller 112 is a graphics controller receiving data from processor 104 and producing graphics output 114. I/O controller 116 is a network controller managing communications between network bus 118 and I/O bus 110. For this embodiment, I/O controllers 112 and 116 are component cards including ICs performing the appropriate functions. Other embodiments could include additional I/O controllers. Controllers 112 and 116 attach to I/O bus 110 at interconnects 120 as shown.

Computer system portion 100 is physically embodied in a printed circuit board (not shown) comprising ICs coupled to the proper circuit traces, or paths, on the printed circuit board.

FIG. 2A shows a simplified illustration 200 of an embodiment of dual voltage component card 202 of the present invention. For this embodiment, dual voltage component card 202 is a memory component card, or memory module. It will be apparent to one of ordinary skill in the art that other types of functionality may be supported on such a card. For example, a component card like component card 202 could be a network card or a graphics card. FIG. 2B shows an end view 240 of component card 202. FIG. 2C is a simplified illustration of an embodiment 260 of a dual voltage component card socket capable of receiving component card 202. Component card 202 includes pin groups 204 and 206, where pin 208 is called out for example. Pin 208 is identical physically to all other pins in pin groups 204 and 206, but various pins are used for different functions. Pin groups 204 and 206 and socket 260 make up interconnect 120.

Referring to FIG. 2A, pin 208 is formed by depositing a highly conductive material, for example gold, onto component card 202. The distance between pins in pin groups 204 and 206 is not indicative of actual pin placement, but is so shown for illustration. The actual configuration of the pins themselves and the distance between them, for this embodiment, is standard and well known for conventional component cards. The number of pins shown in pin groups 204 and 206 is less than an actual number of pins typically used in the preferred embodiment. While the exact number of pins in each group can vary, an embodiment of the invention uses 32 pins in group 204 and 200 pins in group 206.

IC RAMs 212a-212h are attached to component card 202 so that pins of the RAMs electrically connect to circuit paths of component card 202. The circuit paths communicate with pin groups 204 and 206. Pin group 204 comprises pins for power and ground. Pin group 206 comprises pins for power, ground and signal, where signal can be any kind of information signal sent or received by the RAMs, for example, signals for data, address or control. The power voltage for pin group 204 is lower than the power voltage for pin group 206. For this embodiment, the lower voltage is 3.3 volts and the higher voltage is 5 volts.

Component card 202 can be used with 5 volt RAMs 212a-212h or with 3.3 volt RAMs 212a-212h. When 3.3 volt RAMs 212a-212h are used, pin group 204 provides ground and power for RAMs 212a-212h and pin-group 206 provides signal pins. When 5 volt RAMS 212a-212h are used, power and ground are provided as described below. Because the distance traveled by the power signals is large relative to, for example, the distance between pins 206 and RAMs 212a-212h, a possibility of voltage droop exists. To help ensure that the voltage signal will be at an acceptable level when supplied to RAMs 212a-212h, capacitors 210a-210d are provided. Capacitors 210a-210d are connected between power pins of pins 204 and power pins of RAMs 212a-212h to sustain the lower voltage level provided via pin group 204, thereby alleviating voltage droop.

When 3.3 volt RAMs 212a-212h are used, 5 volts may still be supplied to the power pins of pin group 206. Because the 5 volts is not presented to RAMS 212a-212h, however, the 5 volt supply represents an unterminated line. As is well known in the art, unterminated lines can cause problem with signals being transmitted close by, for example ground bounce and crosstalk. To help preserve 3.3 volt signal integrity, capacitors 210e-210l are connected through one terminal to a 5 volt pin of pin group 206 and through the other terminal to a ground pin of pin group 206. This provides a ground return for 5 volt signals on power pins of pin group 206 when 3.3 volt RAMs 212a-212h are used, thereby alleviating ground bounce and crosstalk.

When component card 202 is used with 5 volt RAMs 212a-212h, voltage, ground and signal are all supplied to RAMS 212a-212h by pins 206. In this situation, pins 204 and capacitors 210a-210d are not used.

FIG. 2B shows end view 240 of component card 202. For this embodiment, component card 202 is a dual in-line memory module (DIMM). Dual in-line modules, or component cards, have row of pins on each side of the component card to allow for the receipt and transmission of more signals. For other embodiments, component card 202 could be a single in-line memory module (SIMM), with pins on only one side.

FIG. 2C shows a simplified illustration of an end view of an embodiment 260 of a dual voltage component card socket of the present invention. FIG. 2C shows the end of socket 260 into which component card 202 is installed. The opposite end of socket 220 (not shown) is electrically coupled to a printed circuit board in the computer system of portion 100.

Socket 260 includes lower voltage section 218 and higher voltage section 220. For this embodiment the lower voltage is 3.3 volts and the higher voltage is 5 volts. Section 218 includes housing 228 and connector area 222. 16 connectors are shown in connector area 222 for contacting pins of pin group 204 when component card 202 is inserted into socket 260. For example pin 208 contacts connector 226. Opposite ends of connectors in connector area 226 (not shown) are electri-

cally coupled to appropriate circuit paths on the printed circuit board, for example, by soldering or friction coupling. For this embodiment, connectors of connector area 226 are coupled to ground and 3.3 volt paths.

5 volt section 220 includes housing 230 and connector area 224. Section 220 functions with component card 202 as described with respect to section 218. The connectors of connection area 224, however, are coupled to ground, 5 volt, and signal paths of the printed circuit board.

Claims

1. A component card interconnect apparatus for coupling a component card to a computer system, comprising a component card comprising:

    a first group of in-line pins comprising first power pins for conveying a first voltage; and
    a second group of in-line pins comprising second power pins for conveying a second voltage being lower than the first voltage;
    wherein either the first or the second voltage is conveyed at one time.

2. The component card interconnect apparatus of claim 1, further comprising a socket comprising:

    a first area for receiving the first group of in-line pins and conveying the first voltage; and
    a second area for receiving the second group of in-line pins and conveying the second voltage.

3. The component card interconnect apparatus of claim 1, wherein the component card further comprises capacitors coupled to the second pins for storing the second voltage for use by components on the component card.

4. The component card interconnect apparatus of claim 1, wherein the first group of pins further comprises ground pins and wherein the component card further comprises capacitors coupled to the first power pins and to the ground pins for providing a ground return path for the first voltage when the second voltage is being received by the components.

5. The component card interconnect apparatus of claim 1, wherein the first and second groups of pins are dual in-line pins.

6. The component card interconnect apparatus of claim 1, wherein the first and second groups of pins are single in-line pins.

7. The component card interconnect apparatus of claim 5, wherein the component card is a dual in-line memory module (DIMM).

8. The component card interconnect apparatus of claim 6, wherein the component card is a single in-line memory module (SIMM).

9. In a computer system capable of distributing a first voltage and a second voltage to components of the system, a component card interconnect apparatus comprising:

    a component card comprising:

        a first group of in-line pins comprising first power pins for conveying the first voltage;
        a second group of in-line pins comprising second power pins for conveying the second voltage, wherein the second voltage is lower than the first voltage, and wherein either the first or the second voltage is conveyed at one time;

    a socket comprising:

        a first area for receiving the first group of in-line pins and conveying the first voltage; and
        a second area for receiving the second group of in-line pins and conveying the second voltage.

10. The component card interconnect apparatus of claim 9, wherein the component card further comprises capacitors coupled to the second pins for storing the second voltage for use by components on the component card.

11. The component card interconnect apparatus of claim 9, wherein the first group of pins further comprises ground pins and wherein the component card further comprises capacitors coupled to the first power pins and to the ground pins for providing a ground return path for the first voltage when the second voltage is being received by components on the component card.

12. A computer system comprising components operating at a first voltage and components operating at a second voltage, the computer system further comprising;

    a memory bus;
    an input/output (I/O) bus;
    a network bus;
    a processor coupled to the memory bus;
    a memory system coupled to the memory bus comprising main memory and random access

memory (RAM);

an I/O apparatus coupled to the I/O bus and to the network bus for controlling communications between the I/O bus and to the network bus; and

a component card interconnect for coupling component cards to the computer system, comprising:

a component card comprising:

a first group of in-line pins comprising first power pins for conveying the first voltage to components on the component card;

a second group of in-line pins comprising second power pins for conveying the second voltage to components on the component card, wherein the second voltage is lower than the first voltage, and wherein either the first or the second voltage is conveyed at one time; and

a socket comprising:

a first area for receiving the first group of in-line pins and conveying the first voltage; and

a second area for receiving the second group of in-line pins and conveying the second voltage.

13. The computer system of claim 12, wherein the component card interconnect further comprises capacitors coupled to the second pins for storing the second voltage for use by components on the component card.

14. The computer system of claim 12, wherein the first group of pins further comprises ground pins and wherein the component card further comprises capacitors coupled to the first power pins and to the ground pins for providing a ground return path for the first voltage when the second voltage is being received.

15. The computer system of claim 12, wherein the component card interconnect is coupled to the memory bus and wherein the component card comprises a dual in-line memory module (DIMM) comprising the RAM.

16. The computer system of claim 12, wherein the component card interconnect is coupled to the memory bus and wherein the component card comprises a single in-line memory module (SIMM) comprising the RAM.

17. The computer system of claim 12, wherein the component card interconnect is coupled to the memory bus and wherein the component card comprises an I/O card comprising the I/O apparatus.

18. The computer system of claim 17, wherein the I/O card is a network I/O controller card.

19. The computer system of claim 17, wherein the I/O card is a graphics card.

20. The computer system of claim 12, wherein the first voltage is 5 volts and the second voltage is 3.3 volts.

21. In a computer system supplying a first and a second voltage to a first and a second component, respectively, a method for utilizing either one of the first or second components, comprising the steps of:

receiving a component card in a first area of a socket and a second area of the socket, wherein the component card is electrically coupled to the first component;

receiving the component card in the first area of the socket and the second area of the socket, wherein the component card is electrically coupled to the second component;

supplying the first voltage, data signals and ground signals to the first component through the first area of the socket;

supplying the second voltage to the second component through the second area of the socket and supplying data signals and ground signals to the second component through the first area of the socket;

wherein either the first or the second voltage is supplied at one time.

22. The method of claim 21, further comprising the steps of:

storing the second voltage in capacitors on the component card for use by the second component when the second voltage is being supplied;

passing the first voltage through ground path capacitors on the component card for discharge to ground when the second voltage is being supplied.

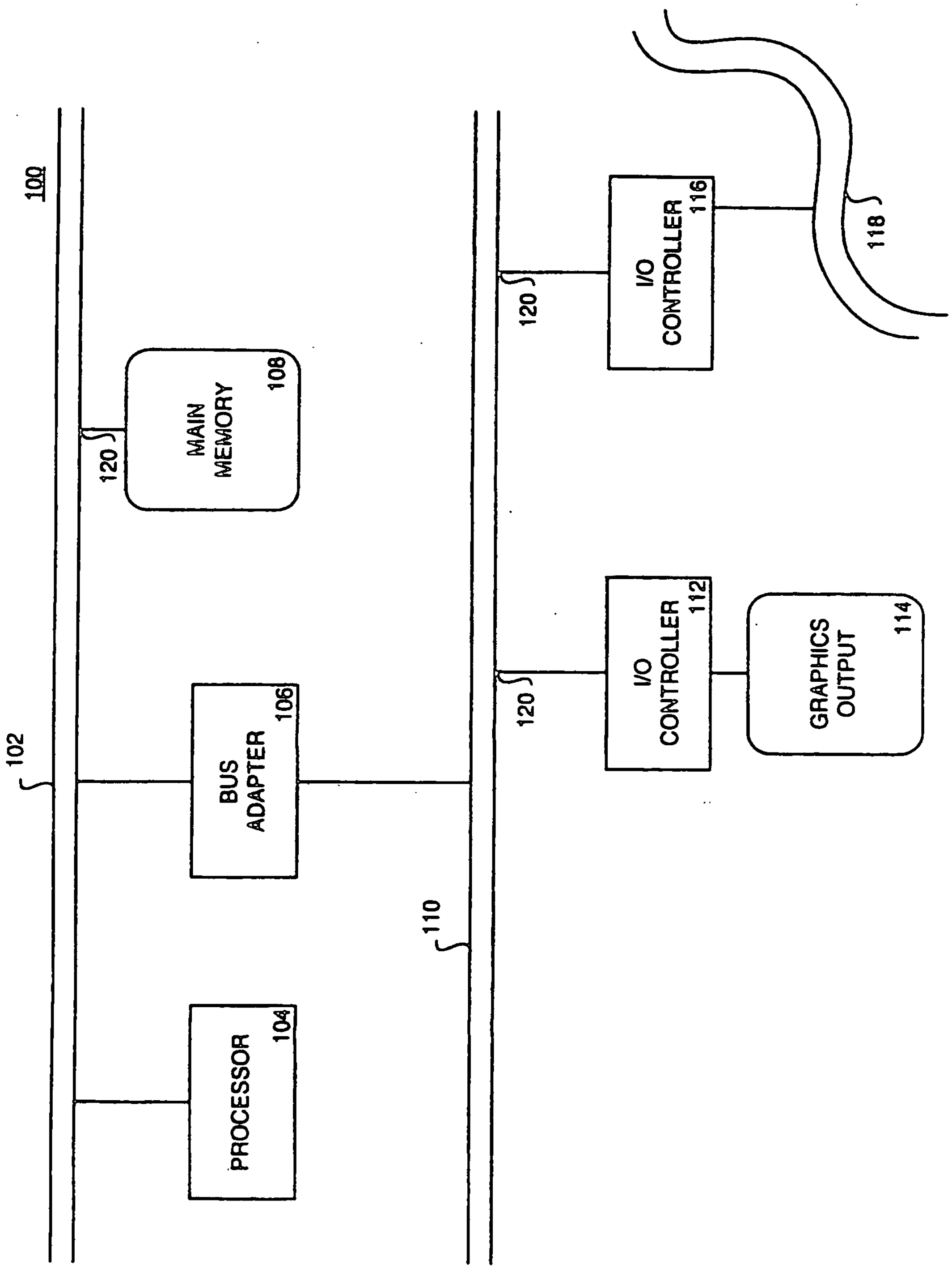
100
102
PROCESSOR
104
BUS ADAPTER
106
MAIN MEMORY
108
120
110
I/O CONTROLLER
112
GRAPHICS OUTPUT
114
I/O CONTROLLER
116
118

FIG. 1

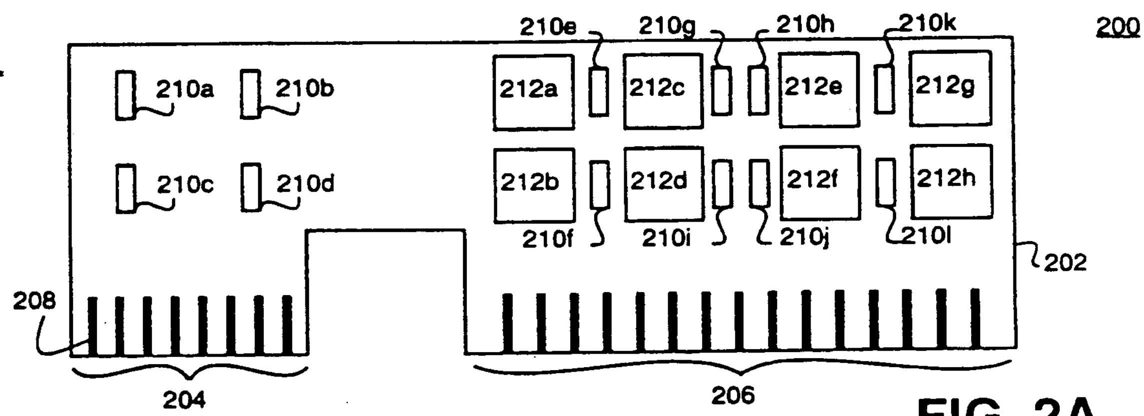

FIG. 2A

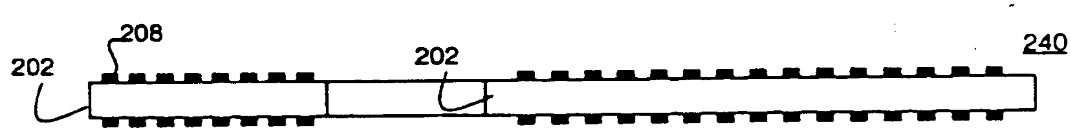

FIG. 2B

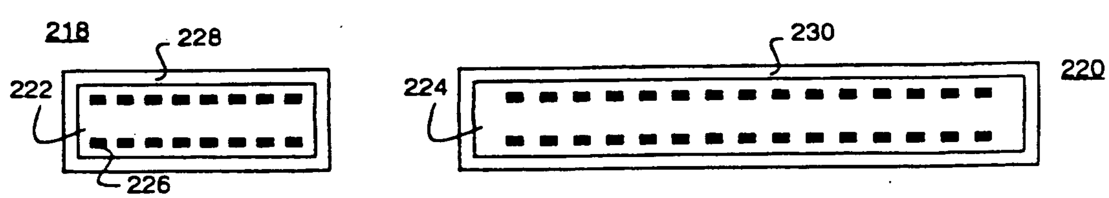

FIG. 2C

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(54) Dual voltage module interconnect

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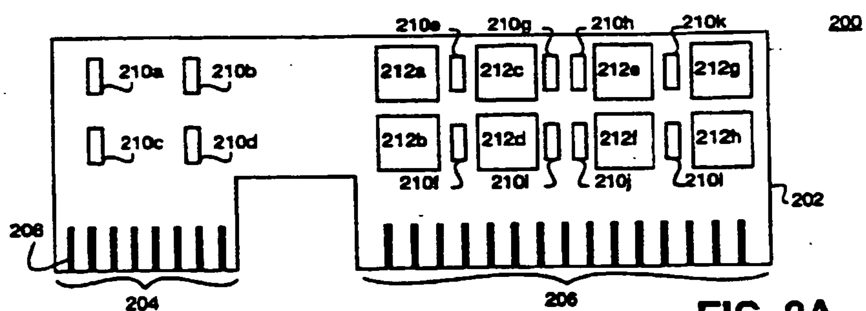

FIG. 2A

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European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 11 0770

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US 5 272 664 A (ALEXANDER DAVID ET AL) 21 December 1993 * column 21, line 44 - line 49; claims 12-14; figures 8A-8D *	1,2,6,8,9,12,16,20,21	G06F1/18 G06F13/40
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A	DE 91 05 280 U (ULRICH KARSTEIN DATENTECHNIK) 27 August 1992 * page 7, line 18 - line 23; claim 7; figure 4 *	1-3,9,10,12,13,21,22	
A	US 5 440 519 A (MART CHASE S ET AL) 8 August 1995 * column 3, line 9 - line 30 * * column 4, line 34 - line 45 * * column 6, line 35 - line 38; figure 2 *	1,3,6,8-10,12,13,16-22	TECHNICAL FIELDS SEARCHED (Int.Cl.6) G06F G11C H05K
A	"ELECTRONIC CIRCUIT BOARD "BUS PLUS"" RESEARCH DISCLOSURE, no. 30211, June 1989, page 402 XP000034721 * the whole document *	1,9,12,21	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	27 January 1999	Durand, J

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 97 11 0770

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